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# Reuse: Promoting Repurposing through an Online DIY Community

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**Abstract**

With the large volumes of waste going to landfills and the increase in popularity with online do-it-yourself communities, there is an opportunity to support renewal and reuse with the content generated from these communities that has yet to be explored. Although do-it-yourself (DIY) sites offer support for repurposing, projects are often presented top-down, potentially requiring users to acquire additional items to complete a project. The *Reuse* application leverages content from existing DIY websites but employs a bottom-up search mechanism that allows of users to search based on the items that she wants to repurpose. This application is intended to encourage and motivate people to reuse, renew, and remanufacture what they own to extend the lifecycle and utility of objects.

**Keywords**

Sustainability, DIY, repurposing, search, online communities

**ACM Classification Keywords**

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

**General Terms**

Design

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### Introduction

The rapid progression of technology has undoubtedly produced many advantageous commodities for the modern era, many of which are essential to our daily lives. However, as the technology evolves, 2580 tonnes of appliances and electronic waste (e-waste) of previous generation electronics fill landfills where the accumulation of toxic metals continues to grow [2]. In addition to e-waste, standard household waste also poses challenges for sustainability. *"In 2004, Canadian households produced 13.4 million tonnes of waste. Nearly three-quarters (73%) of this waste was sent for disposal"* [1]. Manufacturers held accountable for their products turn to the designers to find out how the same technology that simplifies lives can be applied to minimize waste. To accomplish this, designers need to adopt a design approach that considers sustainability as the central focus of interaction design [3]. Along with considering how design moving forward can be more sustainable, designers need to consider new models and incentives for renewal and reuse over disposal [3].

Paralleling the increase in waste, existing do-it-yourself (DIY) sites that indirectly promote reuse and repurposing have become increasingly popular. These creative communities that thrive on the sharing of projects [5] offer an abundance of information on how to reuse and repurpose. In this work, we explore new paradigms and interactive technologies for discovering ways to reuse, renew, and repurpose materials and objects that might otherwise go to waste. We leverage existing technologies such as 2-D barcodes, camera phones, and social networking to create an online community-based system to support reuse and repurposing such objects through DIY projects.

### Problem

As a way of further motivating this work, let us first consider a common everyday object: the cell phone. Cell phones have a lifecycle of less than two years in developed countries [6] and at the end of that lifecycle users are left with few sustainable options for the devices. Previous research has even shown that some cell phone owners will hang on to outdated phones because there is a perceived value and an intuitive understanding that just disposing the phone is harmful to the environment [4]. Other than recycling, another sustainable action that could be taken is repurposing the phone. However this poses a challenge to most users who lack the knowledge and motivation to seek out a solution, solutions that might already exist within larger projects posted on DIY communities. In order for someone to be motivated to take sustainable action, the solution must be accessible and well integrated into everyday life [4]. For those who are motivated, the sources are not only scattered across the internet, but are usually presented in a top down manner, whereby projects are searched by the title rather than by the materials, which makes finding a project that uses a particular set of items difficult. Searching for a solution that uses several items may return different projects for each item which becomes problematic if the each project requires additional materials to complete.

### **Reuse: Bottom-up search to support repurposing**

We designed, prototyped and conducted a preliminary evaluation of *Reuse*, a web application that leverages the existing content on online DIY communities to provide a bottom-up search approach to finding repurposing solutions. In addition to the aggregating

scraped content from existing sites, members of the *Reuse* community can also submitted DIY projects.

Searches are performed bottom-up with a focus on the items that the user would like to repurpose. We liken this model of searching to a recipe website that allows the user to find a recipe based on the ingredients she already has available to her house, rather than searching based on the desired end product. This model of searching is particularly well suited to the goal of encouraging repurposing because it supports the user in finding things to do with what he has, possibly reducing the need to acquire new items to do a project.

*Reuse* includes a cataloguing system that allows users to record items they wish to repurpose. Using the catalogued items the system is able to optimize searches and make recommendations. Cataloguing items also offloads the burden of having to recall items when searching for a project. Objects can be entered into the catalogue in two ways: using a keyboard and mouse through the web interface or through a web-enabled smart phone equipped with a camera. These two different input methods are not simply alternatives. Rather, they support multiple types of use and interactional circumstances, as illustrated by the following two motivating scenarios:

ALICE: CASUAL DESKTOP USE OF REUSE

*Alice is a student who currently lives with her parents and has late commutes from the campus to home. Alice represents an important younger population who are aware of their negative environmental effect, but are not necessarily informed enough to take action. As Alice is cleaning out her parents' basement, she comes across a pile of unwanted objects: an umbrella, old flashlight, and an outdated vinyl poncho. Since the*

*items are all in good condition and operational, she decides not to throw them out, but at the same time she is unsure of what can be done with them. A week later, while on Facebook, she comes across an article that her friend Bob shares on repurposing mittens into a sunglass protector on the site *Reuse*. After following the link to the site she types the items she found in the basement into the search box and *Reuse* returns a project idea that uses all three items to create an umbrella that lights up. The project repurposes the items she previously had no use for into an umbrella that she can use on her late night commutes.*

BOB: INTEGRATING REUSE INTO DAILY ACTIVITY

*Bob is a tech savvy individual who enjoys constructing DIY projects during his free time. While in the process of moving out, Bob comes across some items he has not seen or used in a long time: an old computer, a small cabinet, and a TV tuner card. He takes out his iPhone, opens the *Reuse* application, and photographs the items to enter them into his catalogue. Months after settling into his new home, Bob signs onto his *Reuse* account on his desktop and is reminded of the items he added in the midst of moving. The combination of items inspires Bob to create a media center unit incased in the cabinet. This project will allow him to record his favourite daytime shows while he is at work. Over the next few days Bob completes the project and shares the process with the rest of the community on *Reuse* by uploading photographs and instructions to the gallery and commenting on the project.*

In the first scenario an infrequent user, Alice, uses the content on the site for a one-time project. The system is designed to appeal to this type of user through the ease of use in cataloguing items and the

recommendation system. In the second scenario, Bob is already motivated to create and contribute content. *Reuse*, along with the iPhone application, allows Bob to connect with other creative users and to manage his catalogue when away from a computer.

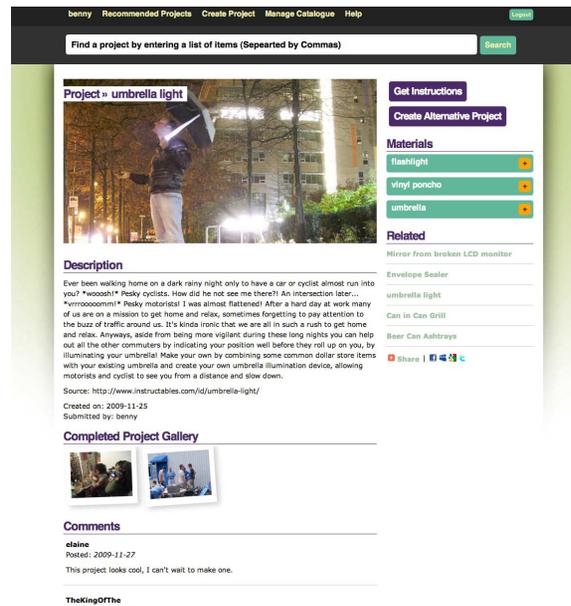


Figure 1: Project page

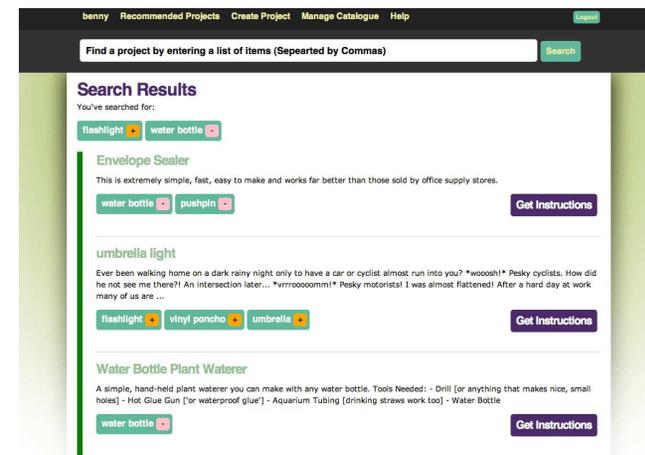
## Implementation

The current version of the prototype was built on the Django web framework, which allows for Agile development, and uses Web 2.0 technologies, such as Ajax, for more transparent database interactions. The iPhone application prototype was implemented similarly as the Safari browser on the device is capable of rendering full HTML web pages. This initial prototype was designed primarily to assess user acceptance of a

bottom-up search for projects. For nonregistered users, the site supports the following features:

*Projects:* Viewing photos of the projects completed by others, project instructions and images for each step. The site also enables users to find a list of related projects, list of materials used and share the project on a social network [Fig 1].

*Searching:* The site allows for single- and multi-item searches where the results are returned in three blocks that represent the level of relevancy. Relevancy is determined by the number of searched items used in a project and is represented by colours: green for the most relevant results, yellow being less relevant and

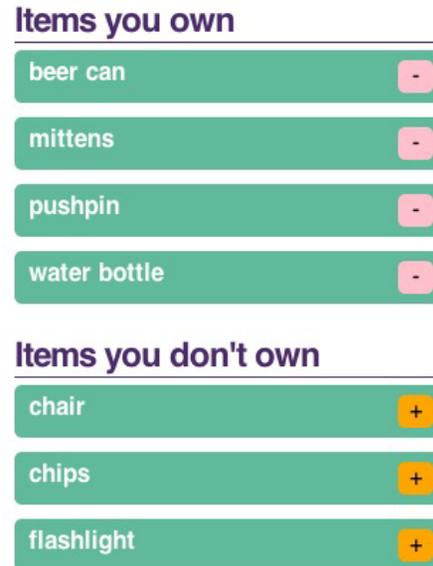


red being the least relevant [Fig 2].

Figure 2: Search results indexed by available items

The site supports two additional features for users who are logged in:

**Cataloguing:** Users can add and manage their inventory of catalogued items. Cataloguing also extends the search terms to the user's inventory to provide broader results. The application also features a button bar for quick additions and removal of common items [Fig 3].  
**Recommendations:** The system can find and recommend projects based on the items stored in the user's catalogue.



**Figure 3:** Features supporting quick add/remove

Because *Reuse* is currently a proof-of-concept prototype, we opted to simulate two complex parts of its functionality. Visual object recognition was simulated with the use of QR codes, a form of two-dimensional barcode that encodes information that can be interpreted by photographing the code. By using QR

codes and the iPhone app, *Barcode*, we were able to explore the value of using a mobile device for item cataloguing without investing development time to object recognition. Additionally, we simulated the functionality to scrape web pages for content. Because we were focusing on the interaction design and user experience of the application in this iteration of the prototype, we opted not to spend time developing complicated information retrieval mechanisms. In place of this we manually created a database of existing projects selected from various existing DIY websites such as [www.lifehacker.com](http://www.lifehacker.com) and [www.instructables.com](http://www.instructables.com).

## EVALUATIONS

We have to date conducted a small-scale pilot evaluation to obtain some preliminary feedback to inform future design iterations as well as future evaluations. All four were students who have had some experience (submitting photos or commenting) with online communities. None were active in any type of DIY community, but almost all stated that they had experience in creating DIY projects either through online resources or on their own. They also stated that they currently engage in some form of sustainable behaviour, mostly recycling, reusing and power consumption awareness. Participants were not familiar with the *Reuse* site prior to the pilot evaluation. Participants were asked to perform a think aloud exercise on series of specific tasks using *Reuse*, such as adding and removing objects from the catalogue, getting recommended projects, retrieving the steps to a project, and searching for projects based on an individual object as well as a list of objects. Afterwards we conducted brief semi-structured interviews that focused on participant experiences with the system to

give them a chance to reflect on any issues, questions or expectations that came up in the process of carrying out the tasks.

Several issues arose from the pilot testing that pertain both to the usability of the interface, as well as the overall concept of *Reuse*. Interestingly, participants wanted to use the search bar both for entering items for reuse, as well as for top-down searches for projects. This was in keeping with participants' curiosity for browsing projects, which they often did between tasks even without instruction to do so. This suggests an important design change for future iterations and a need for a more flexible mechanism that will support both top-down and bottom-up searching.

Technical limitations of the prototype, such as slow response time to searches, and false negatives and slow response time when using the QR-code reader also led to negative feedback from participants. It was clear that future iterations of the prototype needed system status indicators and a more robust QR-code reader with better system integration.

However, despite technical difficulties with the interface, all four participants were generally enthusiastic about the idea of the *Reuse* application and the ease with which it allowed people to find new uses for otherwise unwanted items. They indicated in the follow-up interviews that they would be interested in using *Reuse* to find projects and contribute ideas to the DIY community. This positive feedback is promising, as it suggests that the interactions that *Reuse* supports may encourage and facilitate reappropriate and reuse through DIY.

### Future Work

In addition to the aforementioned improvements to the interface and searching above, next steps for this work include building a more fully functional prototype that can be deployed in a more naturalistic fashion. Such a deployment will allow us to evaluate the effects of this type of searching on people's practices for reuse and reappropriation more thoroughly. We also plan to flesh out more of the community-oriented features of the system that will emphasize the sharing and social networking potential around DIY and reuse. Although still preliminary in nature, we believe this work suggests promise and value for the combination of bottom-up searching and DIY projects to promote sustainability and reuse.

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